

REMARKS

The present Amendment amends claims 1 and 11, leaves claims 2-10 and 12-20 unchanged, and adds new claims 21-24. Therefore, the present application has pending claims 1-24.

35 U.S.C. §102 Rejections

Claims 1-20 stand rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 7,065,589 to Yamagami. This rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-20 are not taught or suggested by Yamagami, whether taken individually or in combination any of the other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims to more clearly describe features of the present invention. Specifically, amendments were made to the claims to more clearly recite that the present invention is directed to a remote copy system and method as recited, for example, in independent claims 1 and 11.

The present invention, as recited in claim 1, and as similarly recited in claim 11, provides remote copy system. The system includes a first storage unit, a second storage unit, and a third storage unit. The first storage unit system is connected to a computer and has a first storage area and a first controller, where the first storage area includes a first disk device. The second storage unit system has a second storage area and a second controller, where the second storage area includes a second disk device. The third storage unit system is connected to the first storage unit system and the second storage unit system, and has a third storage area and a third controller. According to the present invention, the first controller responds to a

write request received from the computer to transmit to the third storage unit system a journal including write data received from the computer and address information indicative of a position in the second storage unit system at which the write data is to be written. The first controller also stores the write data in the first disk device. Furthermore, the first controller returns a response to the write request to the computer after transmitting the journal. Also according to the present invention, the second controller receives first control information issued by the first controller and including a storage position of the journal used when the second storage unit system acquires the journal. The second controller also acquires the journal from the third storage unit system based on the first control information. Furthermore, the second controller stores the write data in the second disk device based on the address information included in the journal. According to the present invention, wherein journal further includes a sequence number, and the sequence number is used to check a dropout of the journal by the first storage unit system and the second storage unit system. The prior art does not disclose all of these features.

The above described features of the present invention, as now more clearly recited in the claims, are not taught or suggested by any of the references of record, particularly Yamagami, whether taken individually or in combination with any of the other references of record.

Yamagami teaches a three data center remote copy system with journaling. However, there is no teaching or suggestion in Yamagami of the remote copy system and method as recited in claims 1 and 11 of the present invention.

Yamagami discloses a remote copy system that includes a first storage system, a second storage system and a third storage system. The first storage system includes a first storage controller and a first data volume. The first storage

controller is configured to control data access requests to the first data volume. The first storage system is configured to store write data in the first data volume upon receiving a write request from a first host associated with the first storage system and generate a journal including control data and journal data. The second storage system includes a journal volume and configured to receive and store the journal generated by the first storage system in the journal volume. The third storage system includes a second data volume and configured to receive the journal from the second storage system and store the journal data of the journal to the second storage system according to information provided in the control data.

One feature of the present invention, as recited in claim 1, and as similarly recited in claim 11, includes where the journal further includes a sequence number, and the sequence number is used to check a dropout of the journal by the first storage unit system and the second storage unit system. Yamagami does not disclose this feature.

In the present invention, there are three storage systems. The third storage system (intermediate site or intermediate storage system) is connected to the first storage system (primary site) and the second storage system (secondary site). In a situation where data written to the first storage system is remote-copied to the second store system through the intermediate storage system, the present invention is quite different from the conventional art.

For example, in the conventional art, the data is remote-copied from the first storage system to the intermediate storage system, and then the data is further remote-copied from the intermediate storage system to the second storage system. That is to say, two remote-copies are required to accomplish the copying of the data from the first storage system to the second storage system. The error detection for

detecting the data transfer errors and the data recovery control are required for each remote copy. In the conventional system, the remote-copy function of the intermediate storage system should provide the error detection process and the data recovery process, which are complicated and heavy-loaded.

In the present invention, the first storage system stores the journal data to the intermediate storage system. The journal data includes the write data and the control data (sequence assurance data indicating data write sequence for error recovery). On the other hand, the first storage system transmits to the second storage system the information indicating the journal data is written into the intermediate storage system. When the second storage system receives the information and recognizes that the journal data is written into the intermediate storage system, the second storage system checks the sequence of the read data using the sequence assurance data. If the sequence is assured, the second storage system stores the data at the address included in the journal data. In other words, the present invention uses the function of data write to the intermediate storage system and the function of data read from the intermediate storage system to relay the data.

The specification of the present application describes two levels of the sequence assurance. The first one is (a) sequence number in the protection data provided for each block of write data (see, e.g., Fig. 5; page 21, lines 17-22; and page 23, lines 8-28). The second one is (b) time stamp in the update request header (see, e.g., Fig. 7; and page 35, line 15 to page 37, line 11). The present invention accomplishes the highly reliable remote copy using such two level data (a) and (b), as described, for example, on page 36, lines 20-27.

The intermediate storage system of the present invention just relays the data and the control information between the first storage system and the second storage system by using the storage device of the intermediate storage system. The intermediate storage system need not have any error detection function or any data recovery function. The error detection process and the data recovery process are performed between the first storage system and the second storage system, without any intervention by the intermediate storage system.

Yamagami corresponds to the above-described conventional art, in which the remote-copy is performed twice. For example, with reference to: column 10, line 1 to column 11, line 22; and Figs. 8 and 9, "the process 900 is similar to the process 700" (see, e.g., column 10, line 66 to column 11, line 1). The process 700 relates to the journal transfer from the primary system to the intermediate system, while the process 900 relates to the transfer from the intermediate system to the secondary system. In this way, remote-copy is repeated twice in Yamagami, which is quite different from the present invention. More specifically, the present invention differs from Yamagami in the function of the intermediate storage system and the remote-copy scheme.

Therefore, Yamagami fails to teach or suggest "wherein said journal further includes a sequence number, and said sequence number is used to check a dropout of said journal by said first storage unit system and said second storage unit system" as recited in claim 1, and as similarly recited in claim 11.

Therefore, Yamagami does not teach or suggest the features of the present invention, as recited in claims 1-20. Accordingly, reconsideration and withdrawal of the 35 U.S.C. §102(e) rejection of claims 1-20 as being anticipated by Yamagami are respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references used in the rejection of claims 1-20.

In view of the foregoing amendments and remarks, Applicants submit that claims 1-20 are in condition for allowance. Accordingly, early allowance of claims 1-20 is respectfully requested.

New Claims 21-24

Claims 21-24 were added to more clearly describe features of the present invention. Claims 21 and 22 correspond to the above-described level (a), while claims 23 and 24 correspond to the above-described level (b). Accordingly, Applicants submit that claims 23 and 24 are allowable for at least the same reasons previously discussed regarding independent claims 1 and 11.

For example, Yamagami fails to teach or suggest “wherein said first controller writes to said intermediate storage system a journal having a write data received from said computer and a sequence number, and writes said write data to said first storage area” as recited in claim 23 and as similarly recited in claim 24.

By way of further example, Yamagami fails to teach or suggest “wherein said second controller reads said write data and said sequence number from said intermediate storage and stores said blocks of said write data to said second storage area” as recited in claim 23 and as similarly recited in claim 24.

By way of even further example, Yamagami fails to teach or suggest “wherein said sequence number is used to check a dropout of said journal by said first storage system and said second storage system” as recited in claim 23 and as similarly recited in claim 24.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (referencing Attorney Docket No. 500.43155X00).

Respectfully submitted,

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.

A handwritten signature in cursive script, reading "Donna K. Mason", written over a horizontal line.

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